



The Arctic winter 2009/2010: Denitrification and polar stratospheric cloud formation

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The sedimentation of HNO_3 containing Polar Stratospheric Cloud (PSC) particles leads to an irreversible removal of HNO_3 and thus a denitrification in the stratosphere which plays an important role in stratospheric ozone depletion. The polar vortex in the Arctic winter 2009/2010 was very cold and stable between end of December and end of January. Strong denitrification was observed in the Arctic in mid of January by the Odin Sub Millimetre Radiometer (Odin/SMR). Thereby, atmospheric gaseous HNO_3 was depleted completely north of Scandinavia. During the time period the vortex was very stable and cold PSCs were observed quite frequently. Lidar measurements of PSCs were performed in the area of Kiruna, Northern Sweden (69°N 21°E) from 3 January to 24 January 2010 with the IRF lidar and from 17 to 30 January 2010 with the Esrange lidar. The measurements show during the entire time period the presence of PSCs over the area of Kiruna. The composition of this cloud changes from NAT to ice in mid January and then back to STS/NAT/mix towards the end of January. The formation of PSCs during the Arctic winter 2009/2010 is investigated using a microphysical box model. Box model simulations are performed along air parcel trajectories calculated six days backward according to the PSC measurements with the ground-based lidar in the Kiruna area. Using the box model simulations along backward trajectories together with the observations of Odin/SMR and the ground-based lidar we investigate how and by which type of PSC particles the denitrification was caused.